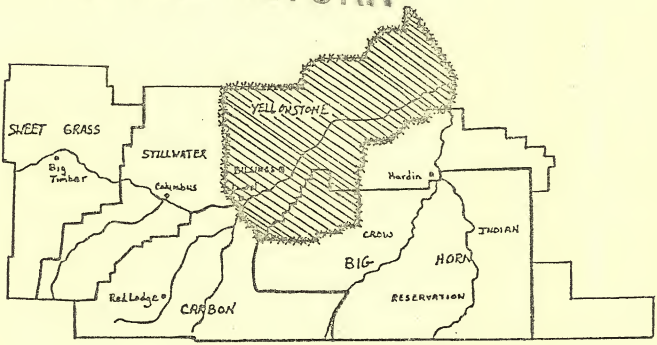
MIDDLE YELLOWSTONE AREAWIDE PLANNING ORGANIZATION AND YELLOWSTONE COUNTY



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MYAPO Board of Directors

Member	Represents
JOHN BESEL, Co. Commissioner Big Horn County Courthouse Hardin, MT	Big Horn County
BJARNE BJORNDAL, Co. Commissioner Sweet Grass County Big Timber, MT	Sweet Grass County
ELIZABETH BRENNAN, Councilwoman 1st Ward, City of Hardin Hardin, MT	City of Hardin
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ED STOW, Chief of Environmental Sciences City/County Health Department Billings, MT	City of Billings
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MYAPO Technical Committee

	County Represented
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JERRY D. DYKSTRA Roberts, MT	Carbon County
RODNEY FINK, Sanitarian Carbon-Stillwater Counties Columbus, MT	Stillwater County
GEORGE FREEMAN , Vice-Chairman Director City-County Planning Board Billings, MT	Yellowstone County
RICK GOLD, Regional Hydrologist Bureau of Reclamation Billings, MT	Yellowstone County
JACK L. GRIBBLE, Director Carbon County Planning Office Red Lodge, MT	Carbon County
ALF HULTENG Water Quality Bureau Billings, MT	Yellowstone County
ELLEN KAYE, Consultant Northern Plains Resource Council Billings, MT	Stillwater/Yellowstone Counties
TOM KELLY, Planner Stillwater County Courthouse Columbus, MT	Stillwater County
ROY LEMBKE, Range Conservationist Bureau Land Management Billings, MT	Yellowstone County
TOM LIPPERT, Sanitarian Hardin, MT	Big Horn County
ROBERT H. MADSEN, Study Manager Yellowstone Level "B" Missouri River Basin Commission Billings, MT	Yellowstone County

MYAPO Technical Committee (Cont)

	County Represented
ROBERT W. MILLER, Ass't. Forest Supervisor Custer National Forest Billings, MT	Yellowstone County
RUSTY ROKITA, Field Assistant Mont. Dept. of Community Affairs Billings, MT	Yellowstone County
MIKE SIERZ, Director Sweet Grass County Planning Big Timber, MT	Sweet Grass County
STEPHEN R. SMITH, District Conservationist Soil Conservation Service Columbus, MT	Stillwater County
TOM SMITH, Environmentalist Montana Power Company Butte, MT	All Counties
GERALD F. WEBER, County Extension Agent Carbon Co. Extension Service Joliet, MT	Carbon County
JAMES YEDLICKA, Chairman Supervisor Soil Conservation District Fromberg, MT	Carbon County

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ROY A. WELLS, Water Quality Specialist

Office address: 3300 2nd Avenue North, Suites 2 & 6
Billings, MT 59101

WHY MYAPO?

1. *What does MYAPO stand for?*

   It stands for the Middle Yellowstone Areawide Planning Organization.

2. *What does Section 208 mean?*

   This is the section of Public Law 92-500, or the National Water Pollution Control Act, Amendments of 1972 (NWPCA-A 1972) that authorizes the Environmental Protection Agency (EPA) to conduct and fund this program.

3. *What is MYAPO doing?*

   It is developing an areawide water pollution control plan. EPA states it a little differently, i.e. "An Areawide Waste Treatment Plan".

4. *What does "areawide" mean?*

   It means that the planning area encompasses more than one county. We are planning for five (5) counties: Big Horn, Carbon, Stillwater, Sweet Grass, and Yellowstone; and the Crow Indian Reservation.

5. *Who determined which counties should constitute the planning area?*

   The Governor of Montana designated the boundaries of the planning area -- sometimes these coincide with economic districts, drainages, or however the Governor decides.

6. *Are there any other designated APOs in Montana?*

   Yes, three others: the Yellowstone-Tongue with six (6) counties and the Northern Cheyenne Indian Reservation, the Blue Ribbons of the Big Sky County with Gallatin and Madison Counties, and the Flathead Drainage with Flathead and Lake Counties.

7. *Will this plan go the route of many other plans, that is to the shelf where it will collect dust?*

EPA stresses that this plan is to be implemented; therefore, it must be economically, environmentally, socially, and institutionally sound.

8. *How much is this program costing the taxpayers?*

The total grant is for $735,000.00. $200,000.00 is to be used for the Crow Tribe subagreement. There is no cost sharing. This is a 100% grant by EPA.

9. *Why should Montanans be concerned about water pollution since most of our streams have high quality water?*

Public Law 92-500 charges EPA to establish water pollution control throughout all of the States. The planning is to cover a twenty (20) year period. Many developments may occur during this time which may change the quality of our waters. For example, in our APO area, hard rock mining may become a reality in the Stillwater Complex. Certainly extensive coal mining will be initiated within the next 20 years in Big Horn County and possibly in Carbon and Yellowstone Counties.

10. *What are the goals of Public Law 92-500?*

The primary aim of the Act is to "restore and maintain the chemical and biological integrity of the Nation's waters". By 1983, wherever possible, water quality is to be suitable for recreational contact and for protection and propagation of fish and wildlife. A further national goal is to eliminate the discharge of pollutants totally by 1985. (This is not a legal binding requirement, however.)

11. *How does the EPA expect to achieve these goals?*

a. EPA has developed an expanded system of federal grants to plan (Facility Planning) and construct (Title II - Grants for Construction of Treatment Works) publically owned waste treatment plants.

b. A permit program (the National Pollution Discharge Elimination System - NPDES permits) has been established and geared to restricting pollutant discharges from point sources (discernible, confined and discrete conveyances, including ditches).

c. Nonpoint sources pollution control is to be achieved by the 208 Program outputs.

12. How is MYAPO organized?

It is a local, five (5) county (and the Crow Tribe) organization. The Board of Directors consists of thirteen (13) members who are representatives of the five (5) county commissions, the Crow Indian Reservation, and the cities or towns of Big Timber, Billings, Bridger, Fromberg, Hardin, Laurel, and Red Lodge. A Technical Committee of approximately twenty (20) members has been formed from all levels of government within the five county area. This group consists of planners, sanitarians, engineers, environmentalists, agriculturalists, and one industrialist. The President of the Board is Frank Cole, Jr., County Commissioner of Carbon County; the Vice-President is Rodney Fink, Sanitarian of Stillwater County; and the Secretary/Treasurer is McLean (Mac) Clark, Mayor of Big Timber. An Executive Committee functions occasionally and consists of the President, Vice-President, Secretary/Treasurer, and two (2) members at large from the Board. The staff consists of a project director, a planner, a public relations person, and a secretary. A water quality specialist from the Water Quality Bureau is assigned to the project.

13. How is MYAPO's Program structured?

Our program is divided into a set of general tasks which are: Administration; Water Quality; Agricultural Nonpoint Source Assessment; Mining, Silviculture, and Construction Nonpoint Source Assessment; Air Quality, Residual Wastes and Land Disposal Evaluation; Facility Planning; Land Use Planning (including Demographic and Economic Projections); Management (including Legal Management); Crow Tribe Administration; and Crow Tribe Subagreement.

14. Is there planning in the nondesignated areas?

Yes, this is performed by the Water Quality Bureau of the State Department of Health and Environmental Sciences.

15. Since the State Water Quality Bureau has control of municipal and industrial waste discharges through the NPDES permit program, what is the thrust of the 208 Program?

The thrust of our program is in nonpoint source pollution control management. That pollution which enters the natural waters without passing through discreet conveyances, pipes, ditches, drains, etc. is considered nonpoint in origin and is related to activities in agriculture, mining, silviculture, construction, and urban runoff. All contribute various forms of pollution; most of these may be controlled in varying degrees by applying good management practices. Therefore, a set of goals of the program is to develop Best Management Practices for each nonpoint source of pollution. Another set of goals is to develop plans for implementation.

16. *Since EPA provides the funds, does EPA establish or dictate policy?*

There is close coordination between MYAPO, EPA, and the State Water Quality Bureau. Direction is given and expertise is offered, but EPA's control is limited by the conditions of the grant agreement. However, EPA does control the funds, and this is persuasive.

17. *What is the thrust in your water quality program?*

The goals of this program are to identify water quality problems, present and potential [over a twenty (20) year period], and to develop programs and solutions. The consultant is the firm of Hurlbut, Kersich, and McCullough, and the amount of the contract is $53,970.00. The study has been divided into three (3) general categories: surface water quality, subsurface water quality, and development-urban runoff.

18. *How are the problems identified and processed?*

The problems have been obtained from the Technical Committee and from the public as a result of public participation meetings in each county. The consultant has also developed problems from the literature review and personal information. A method has been developed for the examination of problems, i.e., The Problem and Solution Documentation Procedure. A simplified version of the program flow is: identify candidate problems, determine specific problems, finalize problems and assign final priority, develop candidate solutions, determine specific solutions, and select recommended solutions.

19. *What is residual waste?*

It is solid, liquid, or sludge substances from man's activities. Our Residual Wastes Program has not been initiated, but contract negotiations have started.

20. *Will your agricultural nonpoint source program place additional burdens upon the farmers and ranchers to control pollution?*

It could be burdensome for the control of some forms of pollution; that remains to be seen. However, the thrust of the program will be to identify agricultural practices that are contributing pollution (sediment, generally speaking), to establish treatment procedures by applying Soil Conservation Service (SCS) Handbook methods, and to recommend to the United States Department of Agriculture (USDA) that these water quality conservation practices be funded realistically through the Agricultural Stabilization and Conservation Service (ASCS) on a cost share basis.

21. *Do you expect to achieve control without becoming involved with permits and enforcement?*

That is a good question. Some of our problem streams may have substantial sediment generated as a result of poor range management practices; some irrigation return flows may return sediment, but frequently this load is less than the load that is originally picked up in the ditch; waste spilling may or may not be a problem; poor irrigation practices may accelerate channel erosion; there are other sediment producing agricultural practices. However, in our MYAPO district there is also much natural erosion of stream banks due to the erosive nature of the soils; contribution from agriculture is probably not as great as it is frequently made out to be. An incentive approach has merit, and with reasonable cooperation from the farmers and ranchers significant reduction in sediment from poor agricultural practices will be achieved.

22. *Do you expect to use an incentive program to control NPS pollution in mining, silviculture, and construction?*

No. It is possible that laws on the books cover these situations. This is being determined by our legal consultant who may determine that a comprehensive erosion

and sediment control law is needed. It probably would require that plans for sediment control measures on small operations be submitted to some agency, and that those planning extensive projects obtain permits which would hold the permittee to complete performance of the submitted plan.

23. *How are you going to implement the plan?*

This question cannot be answered at this time. All point source aspects of the plan will probably be implemented by the State Water Quality Bureau. As was previously mentioned, there may be adequate laws on the books to achieve NPS pollution control. New erosion and sediment control legislation may have to be drafted. The Conservation Districts may perform various functions in implementation. It may be feasible to establish an areawide planning and implementation office. These alternatives and others will be examined, and the best approach will be promoted. The public will have an opportunity to participate in the planning process.

Priorities by County and Area

	Big Horn	Carbon	Stillwater	Sweet Grass	Yellowstone	Area
1. Facility Planning	(H)	(H)	(H)	(H)	(H)	(H)
2. Mining	(H)	M	(H)	(H)	L	(H)
3. Recreation-Subdivision	L	(H)	(H)	M	(H)	(H)
4. Groundwater	(H)	L	(H)	L	(H)	M
5. Agricultural Source	M	(H)	L	L	M	M
6. Construction	M	L	(H)	(H)	M	M
7. Residual Wastes	M	M	L	M	L	M
× 8. Salt Water (Saline Seeps)	L	L	(H)	L	M	M
9. Silvicultural	L	M	L	M	L	M
10. Urban Stormwater	L	L	L	L	M	L
11. Industrial	L	L	L	L	L	L
12. Hydrographic	L	L	L	L	L	L

BIG HORN COUNTY

City	Consultant
Lodge Grass	Mueller Engineering, Inc. of Billings Robert Sanderson

CARBON COUNTY

City	Consultant
Bearcreek (under consideration)	Hurlbut, Kersich, & McCullough of Billings David McCullough
Fromberg	Morrison-Maierle, Inc. of Billings Larry Larsen

STILLWATER COUNTY

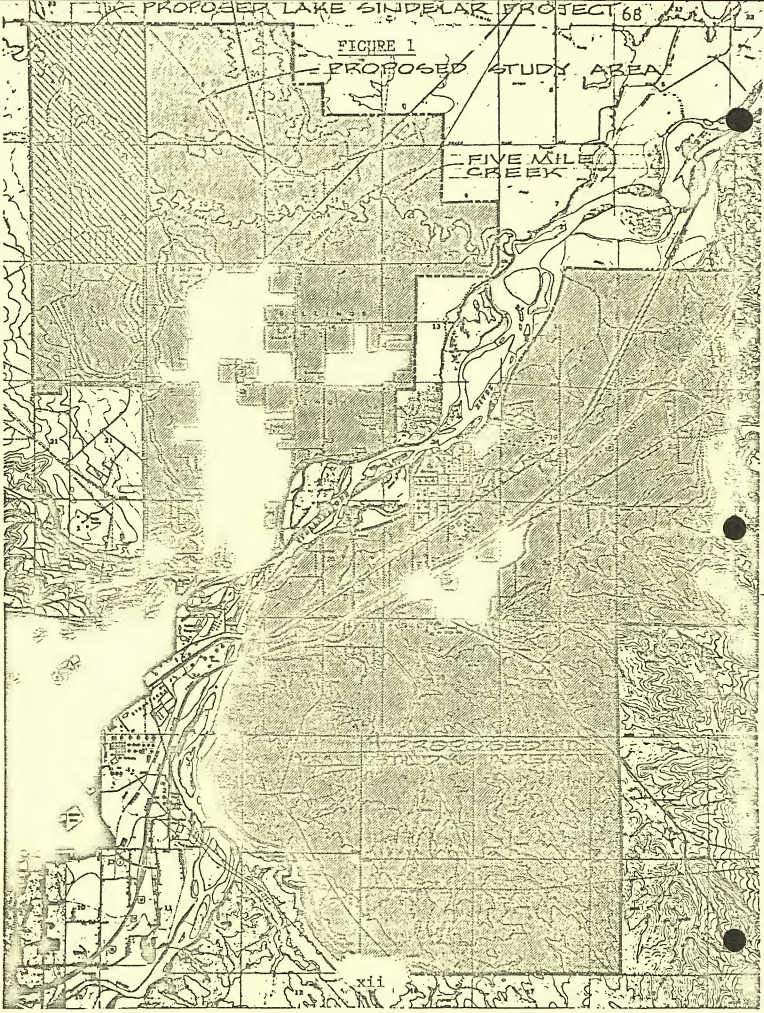
City	Consultant
Fishtail	Mueller Engineering, Inc. of Billings Robert Sanderson
Reed Point	Morrison-Maierle, Inc. of Billings Larry Larsen

SWEET GRASS COUNTY

City	Consultant
Big Timber	Wenzel and Company of Great Falls Jim Heberly

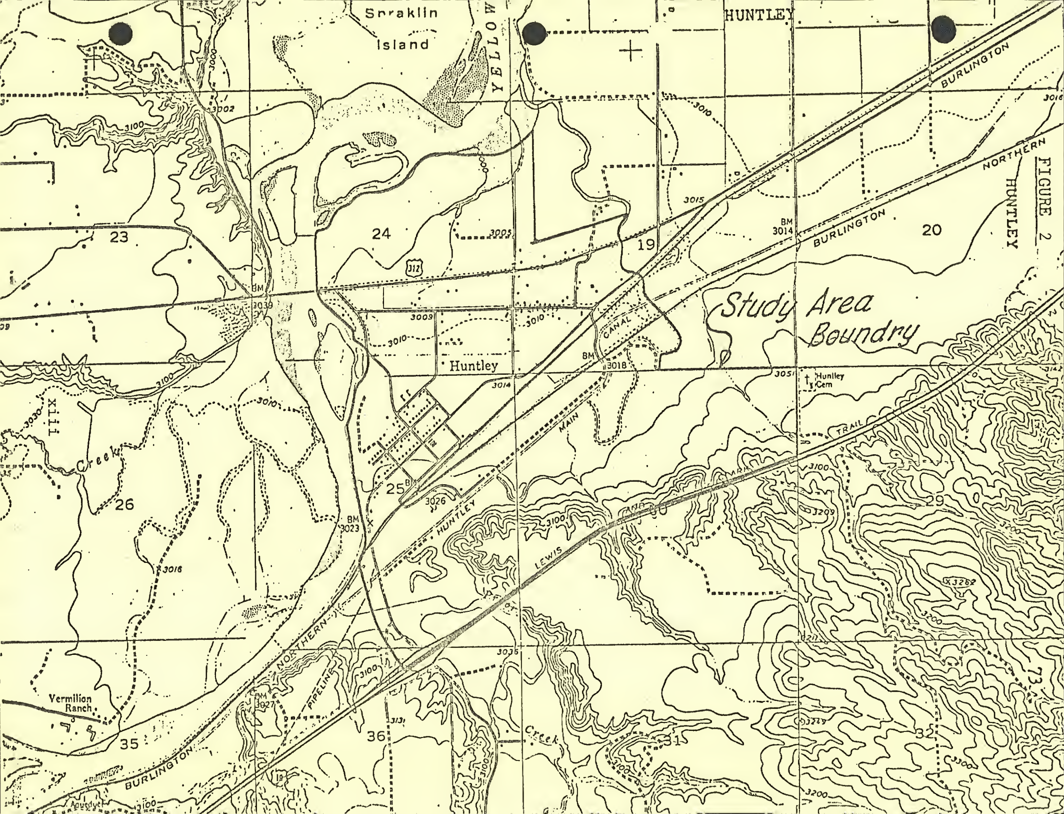
YELLOWSTONE COUNTY

City	Consultant
Billings Heights-Lockwood	Christian, Spring, Sielbach & Associates of Billings Gerald Gaston
Huntley	Morrison-Maierle, Inc. of Billings Larry Larsen



BILLINGS HEIGHTS - LOCKWOOD 208

PREPARED BY: CHRISTIAN, SPRING, SIELBACH & ASSOC.



Spraklin
Island
YELLOW
HUNTLEY
BURLINGTON
NORTHERN
BURLINGTON
HUNTLEY
Study Area
Boundry
Huntley
Huntley Cem
CANAL
MAIN
HUNTLEY
LEWIS
AND
TRAIL
CLARK
Creek
Creek
NORTHERN
PIPELINE
BURLINGTON
Vermilion
Ranch
Aqueduct
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BM 3039
BM 3014
BM 3018
BM 3023
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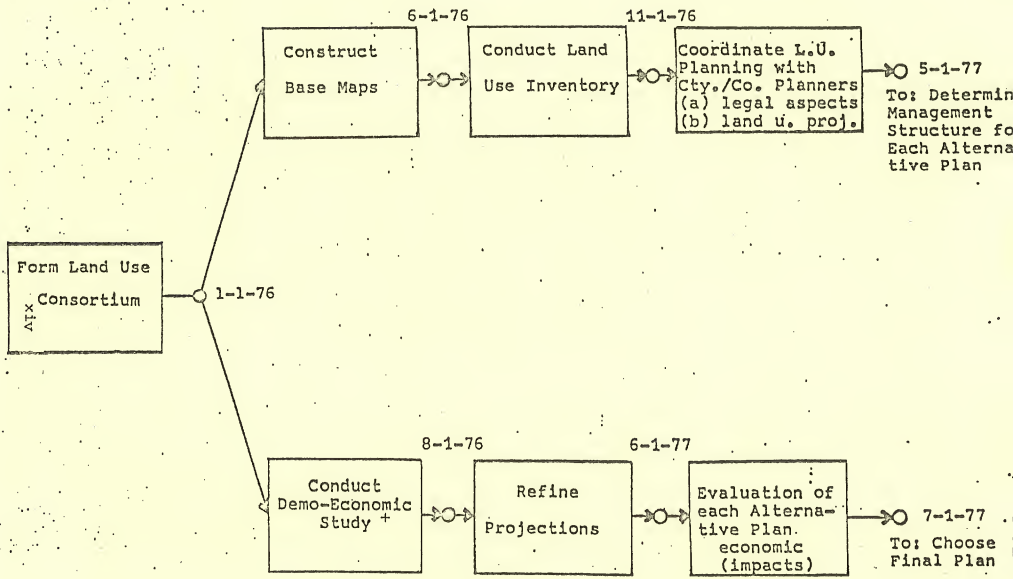
FIGURE 2

Figure 3

LAND USE PROGRAM *



* Revised: Does not correspond with overall 208 flow diagram.

\+ Demo-Economic Program included in Land Use Program for organizational purposes.

Land Use Classification System

1. Urban, Scattered, and Built Up
   - 1.1 residential/commercial
     - 1-a high density (1 or more D.U./acre)
     - 1-b low density (.05 to .9 D.U./acre)
   - 1.2 rural areas
   - 1.3 industrial
   - 1.4 water, sewage, and solid waste facilities
   - 1.5 second home subdivisions (unplatted)
   - 1.6 platted subdivisions

2. Recreation Areas
   - 2.1 national wildlife refuges
   - 2.2 campgrounds/reststops/ fishing access
   - 2.3 wilderness areas (proposed)
   - 2.4 blue ribbon fisheries
   - 2.5 other fisheries
   - 2.6 state parks/state or national recreation areas
   - 2.7 ski areas
   - 2.8 other

3. Agricultural, Range, Forest, and Problem Lands
   - 3.1 urban and scattered built-up
   - 3.2 irrigated lands
   - 3.3 dry croplands
   - 3.4 commercial feedlots
   - 3.5 grasslands
   - 3.6 coniferous forests
   - 3.7 deciduous forests
   - 3.8 bad lands (clay hills)
   - 3.9 saline seeps
   - 3.10 alkali flats
   - 3.11 irrigation canals
   - 3.12 marsh lands

4. Mineral and Energy Production Areas
   - 4.1 coal deposits
   - 4.2 deposits of other minerals (e.g., chrome, uranium, copper, etc.)

(continued)

(continued)

- 4.3 areas of open pit extraction
- 4.4 past and present underground mining sites
- 4.5 rock quarries, sand and gravel pits
- 4.6 deposits of sand, gravel, bentonite, limestone, etc.
- 4.7 storage areas and tailings ponds (past and present)
- 4.8 oil and gas fields
- 4.9 potential geothermal areas

Land Suitability System

1. Land Ownership
   - 1.1 state lands
   - 1.2 U.S. Forest Service
   - 1.3 BLM
   - 1.4 private lands
2. Climate (Precipitation)
3. Soil Associations
4. Geological Features and Groundwater Recharge Areas

NEWS

Country club sewer project is proposed

Yellowstone County Commissioners Tuesday afternoon passed a "resolution of intent" to establish a Rural Special Improvement District (RSID) in Yellowstone Country Club Subdivision.

Commission Chairman Leo Kamp said that according to petitions collected, the RSID has the support of more than 60 per cent of the freeholders in the subdivision, which includes the private Yellowstone Country Club. The support was indicated in signatures on a petiton requesting creation of the RSID.

The RSID is designed for a sewer system and would cost about $986,000 over a 15-year period.

Presently, property owners in the area are using septic tanks and want a system similar to the sewer system used by St. John's Nursing Home, Kamp said.

That system works independently of the city of Billings, Kamp said, and was designed by an engineer.

The system would include a mini-treatment plant that would digest solids and treat the liquid discharge so that it would be both sterile and oderless and could be used for irrigation at the golf course.

Engineers for the project are Engineering West, who will present their formal petition to create the RSID at a July 13 hearing.

The public meeting will be at 11 a.m. in the commissioners' boardroom, first floor of the courthouse.

"We heard rumors that there were quite a number of protesters," Kamp said, "but so far no one has shown any opposition."

Once the engineer's official estimate and maps of the district are on file, the hearing is held and the RSID bonds are sold, Kamp said.

Laurel owns water plant

Laurel's water plant, built 20 years ago, is paid for. The final payment $20,000, on the 20-year bond issue was paid in July, Mayor Louie Yovetich, states.

And just like most homeowners - about when the end of payments are in sight, it's time to remodel or upgrade -- the city is planning to update the city's water plant.

A Community Development Act grant has been approved for the city to aid in financing a portion of the costs for the remodeling program.

Part of the need for upgrading the water plant is, of course, due to age; however, the major need is due to Laurel's growth over the past two years, which exceeds the projected growth figure for the city given at the time the plant was built.

Laurel Outlook
9/29/76

Hearing may affect all state water

On Tuesday, Aug. 24, a public hearing is scheduled at the high school in Columbus at 7:30 p.m. regarding the discharge permit for the Johns-Manville Corp.

Last May, the company was fined $10,000 by the Department of Health for putting ammonium nitrates in the West Fork of the Stillwater River without a discharge permit. The permit is required as a section of the Water Pollution Control Act.

Issuance of the discharge permit is the first occasion where the serious question of the interpretation of nondegradation of water quality is being raised. If the Department of Health allows a weak permit to be issued, it will be precedent setting for future mining activi-
2 Stillwater region.
xviii s will have a significant effect on the important value agriculture and recreation have for the quality of these waters.

The decision made here will most likely effect water quality decisions in the entire state.

The Stillwater Protective Association, an affiliate of the Northern Plains Resource Council, wants everyone concerned with and affected by the quality of water in the Stillwater to attend the hearing and represent your interests.

Mary Donohoe
President
Stillwater Protective
Association
Absarokee

EPA puts squeeze on Anaconda Co.

HELENA (AP) — The state Board of Health approved an agreement Friday that requires the Anaconda Co. to take further steps toward contolling particulate emissions from its smelter at Anaconda.

The agreement, between the company and the state Department of Health and Environmental Sciences, was made under pressure from the U.S. Environmental Protection Agency.

However, Fred O. Gray, a Health Department environmental engineer, told the board that he doubted the agreement would satisfy the EPA.

In other action, the board agreed to postpone until Nov. 19 a hearing on the company's request for authority to continue operating the smelter in violation of regulations to control sulfur dioxide emissions.

The company and the department requested the board to delay the hearing because studies on the emission levels have not been completed.

The agreement on particulate emissions sets up timetables for Anaconda Co. to complete various tests, studies and engineering plans and to modify equipment and operations.

Gray's report to the board said that the department believes that there are additional steps, beyond the agreement, that the company must take to meet the standards.

"It is anticipated that those matters that cannot be resolved will be the subject of additional action in the future," the report said.

On March 19, the Health Board issued a compliance order that directed Anaconda to make other specific changes to control particulate emissions of the copper smelter in Anaconda.

On the same day, the Health Board gave the company authority to continue operating the smelter in violation of particulate emission standards until Dec. 31, 1976.

The smelter has been operating under such Health Board variances since March 1973.

Last February, the EPA notified Anaconda that the smelter was not meeting the state particulate-emissioq standards and requested that the state come up with a compliance order and timetable within 60 days.

Gray's report said that the EPA had agreed to wait until Friday's board meeting to determine "if a basis for complying with (the EPA's) request is established.

"However, EPA has indicated that after today no more extension of time will be granted for development of this plan."

Steve Brown, Health Department attorney, noted that the department and Anaconda do not agree on numerous steps that may be needed for the smelter to comply with the regulations.

He said that decisions to deal with the unresolved issues will have to be made by the company, the department and the EPA.

EPA investigates sewer smell

By CAROLE LOGE
Of The Gazette Staff

Complaints from some Billings Heights residents upset by odor from Billings' new sewage treatment plant brought the problem to the attention of the Environmental Protection Agency this month.

An inspection of the plant by an EPA-funded team triggered a state-level follow-up last week by Ed Wadington of Billings' Air Quality Bureau.

City officials and a water quality expert also made the tour, which was designed to pinpoint sources of the odors which have plagued some Heights residents all summer.

Complaints reached "appropriate levels" to justify an inspection, Wadington said.

Although he was impressed with the efforts to eliminate odors at the new pla[illegible] xix made three recomendations to Mike Roach of Helena, chief of the Air Quality Bureau of the Department of Health and Environmental Sciences:

- The city should, when possible, chlorinate the sludge holding tank and deploy gas "scrubbers" on two other systems to reduce odor.
- The plant should be re-inspected after this step is completed and complaints from the public should be "monitored.".
- The city should consider a dome over the sludge-holding tank, but only as a last-resort measure.

Wadington said chlorination, which he believes will considerably reduce the plant's odor, cannot be accomplished until the new plant is completed. The construction deadline falls later this month.

"It's my feeling that they may have to [illegible]ome the sludge holding tank, but it would be [illegible]remature to do that now before the plant is completed and other methods (of odor reduction) have been tried," he said.

I. HISTORICAL OVERVIEW

YELLOWSTONE COUNTY

The recent history of Yellowstone County has been opposite that of the rest of the region in almost every respect. Employment and population increased between 1960 and 1970. Income levels were above the state level and only slightly below the national level in 1970. Poverty-level families made up a smaller proportion of the population of Yellowstone County than they did for the nation in 1970. Yellowstone County did experience net out-migration in the 1960s, but the percentage was just slightly over 2.0 percent as compared to 8.6 percent for Montana.

The primary factor in the economic well-being of Yellowstone County is the presence of Billings, the largest city in Montana. Billings is the trade center of a large region and the regional headquarters for several federal agencies. It is the site of considerable manufacturing activity, especially in the food-processing and petroleum-processing sectors. In summary, Billings is the hub of economic activity in the county. In addition to Billings, the city of Laurel, also in Yellowstone County, is the site of a large number of jobs. The county also has considerable agricultural activity. The final result is a diverse economic base which can withstand employment and income declines in a single economic sector or industry.

The relatively strong economic position of Yellowstone County can be seen in its employment growth. Between 1960 and 1970, employment increased by 12 percent. This economic growth was considerably higher than the region and Montana as a whole. It was, however, lower than the national average. Thus, although total population increased by more than 10 percent, there was a slight net out-migration from the county. The net migration for Billings, however, was into the city by a small amount.

Economic growth in Yellowstone County resulted in relatively high income levels for its residents. The median family income was above the national and state medians in 1960 and above the state median in 1970. In proportion to its population, Yellowstone County also had fewer families with poverty-level income than did the state or the nation in 1970.

Economic and population growth have continued to occur during the first half of this decade. Population has increased by at least 10,000 persons and employment had increased by almost 6000 by 1973 (Bureau of Economic Analysis).

A. POPULATION

There are three characteristics of the population which are important in the identification of regional patterns and which are especially helpful in population projections. These characteristics are discussed below and include: 1) number of inhabitants; 2) racial composition; and 3) sex and age composition. The first of these--number of inhabitants--is discussed with emphasis on two time periods, the 1960s and the first half of the 1970s. The experiences in each of these periods were dissimilar in all five counties. The second characteristic--racial composition--is important in understanding the region's population because of its influence on fertility rates and migration rates. Sex and age composition in the region are presented third. These give additional insight into demographic conditions.

Scrutiny of Table I-1 provides several conclusions regarding the population of the MYAPO region. The most striking observation is, as mentioned earlier, the dominance of Yellowstone County. Billings, located in Yellowstone County, is the largest city in Montana with a 1970 population of 61,581; the city constituted nearly 55 percent of the population of the entire region in that year. The county as a whole made up 74 percent of the region's population in 1960 and 78 percent in 1970 and 1975.

Table I-1 also demonstrates that the population of the MYAPO region has increased considerably over the 15-year period. Using the low 1975 estimate for Yellowstone County, the total increase was 17,944 or 16.9 percent. Over two-thirds of this growth occurred in the early half of this decade. The regional total, however, masks large differences in population changes within the area; the most significant change was a population decline during the period from 1960 to 1970 in the three smallest counties--Carbon, Stillwater, and Sweet Grass. The decreases were large, varying from a low of 9.4 percent decrease in Sweet Grass County to a high of 16.2 percent in Stillwater County. The out-migration of persons of working age seeking jobs was the primary cause of the population declines. Although the specific causes are discussed in more detail in the following sections, the out-migration was due primarily to the agricultural nature of the economic base. Agriculture, as an industry, experienced declining employment during the 1960s and early 1970s and, therefore, forced out-migration of young people who were reaching job age.

TABLE I-1

POPULATION OF THE MYAPO REGION AND EACH COUNTY,
1960, 1970, AND 1975

County	1960	1970	Percentage Change 1960-1970	1975	Percentage Change 1970-1975	Percentage Change 1960-1975
Big Horn	10,007	10,057	0.5	10,900	8.4	8.9
Carbon	8,317	7,080	-14.9	7,700	8.8	-7.4
Stillwater	5,526	4,632	-16.2	5,300	14.4	-4.1
Sweet Grass	3,290	2,980	-9.4	2,900	-2.7	-11.9
Yellowstone	79,016	87,366	10.6	97,300	11.4	23.1
MYAPO Total	106,156	112,115	5.6	124,100	10.7	16.9
Montana	674,767	694,409	2.9			
U.S.	179,323,175	203,211,926	13.3			

Source: U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1964).

U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: Montana (Washington, D.C.: U.S. Government Printing Office, 1963).

U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1973).

U.S. Bureau of the Census, Census of Population: 1970, General Population Characteristics: Montana (Washington, D.C.: U.S. Government Printing Office, 1971).

U.S. Bureau of the Census, "Population Estimates and Projections", Current Population Reports-Series P-26 (Washington, D.C.: U.S. Government Printing Office, 1975).

TABLE I-2

RACIAL COMPOSITION OF MYAPO REGION POPULATION
1960 and 1970

County	White		Indian		Other Non-white	
	Number	% of Total	Number	% of Total	Number	% of Total
Big Horn						
1960	6584	65.8	3334	33.3	89	0.9
1970	6018	59.8	3917	39.0	122	1.2
Carbon						
1960	8300	99.8	5	0.1	12	0.1
1970	7022	99.2	29	0.4	29	0.4
Stillwater						
1960	5511	99.7	12	0.2	3	0.1
1970	4595	99.2	23	0.5	14	0.3
Sweet Grass						
1960	3290	100.0	---	---	--	---
1970	2978	100.0	2	---	--	---
Yellowstone						
1960	78227	99.0	410	0.5	379	0.5
1970	85765	98.2	1063	1.2	539	0.6
MYAPO Region Total						
1960	101912	96.0	3761	3.5	483	0.5
1970	106378	94.9	5034	4.5	704	0.6
Montana						
1960	650538	96.4	21181	3.1	3048	0.5
1970	663043	95.5	26385	3.8	4981	0.7
United States						
1960	158,837,679	88.6	523,591	0.3	19,964,405	11.1
1970	178,119,221	87.6	763,594	0.4	24,327,343	12.0

Sources: U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1964).

U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: Montana (Washington, D.C.: U.S. Government Printing Office, 1963).

U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1973).

TABLE I-3

SEX DISTRIBUTION BY COUNTY AND REGIONAL TOTAL
1960 and 1970

	Male		Female	
County	Number	%	Number	%
Big Horn				
1960	5,032	50.3	4,975	49.7
1970	4,990	49.6	5,067	50.4
Carbon				
1960	4,203	50.5	4,114	49.5
1970	3,559	50.3	3,521	49.7
Stillwater				
1960	2,863	51.8	2,663	48.2
1970	2,338	50.5	2,294	49.5
Sweet Grass				
1960	1,689	51.3	1,601	48.7
1970	1,556	52.2	1,424	47.8
Yellowstone				
1960	38,843	49.2	40,173	50.8
1970	42,459	48.6	44,907	51.4
MYAPO Region Total				
1960	52,630	49.6	53,526	50.4
1970	54,902	49.0	57,213	51.0
Montana				
1960	343,743	50.9	331,024	49.1
1970	347,005	50.0	347,404	50.0
United States				
1960	88,331,494	49.3	90,991,681	50.7
1970	98,912,192	48.7	104,299,734	51.3

Sources: U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1964).

U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: Montana (Washington, D.C.: U.S. Government Printing Office, 1963).

TABLE I-4

LABOR FORCE, EMPLOYMENT, AND UNEMPLOYMENT RATE OF THE MYAPO REGION, MONTANA, AND THE UNITED STATES 1960 and 1970

	Civilian Labor Force		Employment		U/LF	
	1960	1970	1960	1970	1960	1970
Big Horn	3,265	3,317	2,941	3,163	9.9%	4.6%
Carbon	3,053	2,524	2,940	2,393	3.7%	5.2%
Stillwater	2,010	1,617	1,966	1,529	2.2%	5.4%
Sweet Grass	1,268	1,276	1,208	1,249	4.7%	2.1%
Yellowstone	31,518	34,996	29,470	32,966	6.5%	5.8%
MYAPO Region	41,114	43,730	38,525	41,300	6.3%	5.6%
Montana	248,073	270,834	231,270	248,342	6.8%	8.3%
United States	68,144,079	80,051,046	64,639,252	76,553,599	5.1%	4.4%

Sources: U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: Montana (Washington, D.C.: U.S. Government Printing Office, 1963).

U.S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics. Final Report PC(1)-C28 Montana. (Washington, D.C.: U.S. Government Printing Office, 1971).

U.S. Bureau of the Census, Census of Population: 1960, Characteristics of the Population: U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1964).

U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics: U. S. Summary (Washington, D.C.: U. S. Government Printing Office, 1973).

1. Employment

Employment in 1960 and 1970, as reported by the Bureau of the Census, is shown in Table I-4 (comparable data are not available for 1975). Employment increased in the MYAPO region by 7.2 percent during the 1970s. This increase is similar to that of Montana (7.4 percent), but it is less than half of the percentage increase in the United States as a whole (18.4 percent). Employment, then, increased much more slowly in the region than it did elsewhere in the nation. The net out-migration from the region noted above can be seen as a direct result of the region's slow economic growth compared to other areas.

Yellowstone County experienced the most rapid growth during the 1960s. The total employment increase was 11.9 percent, or at an annual rate of growth of one percent. This rate of growth, although higher than Montana in general (.7 percent), was well below the 1.7 percent annual growth rate for the nation.

2. Unemployment Rate

In 1960, the MYAPO region had a somewhat lower unemployment rate than Montana but a somewhat higher rate than the nation. Unemployment rates were lowest in the three western-most counties and were lower than the national rate. Yellowstone County was near the state average but higher than the average for the region.

The labor force participation rates for males in the region are very similar to males in Montana and the United States. Yellowstone County, however, shows higher than average labor force participation. This may help explain the somewhat higher than average unemployment rate mentioned above. Carbon County shows exceptionally low participation rates in 1970. This is understandable in light of the fact that the participation rates are based on all persons over 15 years of age.

Unemployment rates in the four-county region have increased gradually throughout the 1970s, and in every year since 1970 they have been higher than in the rest of Montana and the United States. Yellowstone County remained relatively constant and very near the national average until 1975. In 1975, the unemployment rate there reached its highest point at 6.7 percent, an increase of 1.4 percent over 1974.

TABLE I-5

UNEMPLOYMENT RATES
MYAPO REGION, MONTANA, AND THE UNITED STATES
1970 THROUGH 1975

	Four-County Region*	Yellowstone County	Montana	United States
1970	5.4	5.2	5.5	4.9
1971	6.3	5.5	6.3	5.9
1972	6.9	5.6	6.2	5.6
1973	6.9	5.1	6.3	4.9
1974	7.1	5.3	6.7	5.6
1975	7.3	6.7		

*Big Horn, Carbon, Stillwater, and Sweet Grass Counties combined.

Source: Montana and United States data from: Manpower Report of the President, U.S. Government Printing Office, Washington, D.C., April 1975, p. 230, and p. 298, respectively.

MYAPO Region data from: State of Montana Employment Security Division, Montana's 14 Major Labor Market Areas, Helena, January, 1976, pp 24-5, 94-5.

TABLE I-6

MEDIAN FAMILY INCOME
MYAPO REGION, MONTANA, AND THE UNITED STATES
1960 and 1970

	Median Family Income			
	1960		1970	
	Current dollars	Constant[a] 1958 dollars	Current dollars	Constant[b] 1958 dollars
Big Horn	$4,375	$4,252	$7,310	$5,634
Carbon	4,336	4,214	6,578	5,087
Stillwater	4,790	4,655	6,752	5,222
Sweet Grass	4,333	4,211	6,530	5,050
Yellowstone	6,150	5,977	8,966	6,934
Montana	5,403	5,251	8,512	6,583
United States	5,660	5,500	9,596	7,422

[a]Calculated using 1960 personal consumption deflator of 102.9

[b]Calculated using 1970 personal consumption deflator of 129.3. Deflators from Economic Report of the President, (Washington, D.C.: U.S. Government Printing Office, February 1974), p. 252.

II. THE BASIC INDUSTRIES OF THE MYAPO REGION

A. AGRICULTURE

The Yellowstone River valley crosses the MYAPO region in an east-west direction and is a fertile farmland belt. The agricultural history of the valley dates back to the first permanent settlements and has been the single most significant factor in the settlement and tradition of the area. The role of agriculture in the economy has declined somewhat over the last 15 years, but it is still the single most important economic sector in four of the five MYAPO counties.

Table II-1 presents the agricultural employment of the counties for 1973, the last year for which county specific data are available. It is evident that each of the counties except Yellowstone derives a large portion of its employment from agriculture. Yellowstone County has the largest absolute amount of agricultural employment of any single county, but the county's economy is so diverse that agriculture accounts for less than four percent of total employment. The other counties have less total agricultural employment but in each case the proportion of total employment is approximately one-third.

TABLE II-1

AGRICULTURAL EMPLOYMENT
1973

	Agricultural Employment	% of Total Employment
Big Horn	1095	28.2
Carbon	967	31.2
Stillwater	679	36.2
Sweet Grass	467	31.6
Yellowstone	1689	3.9
MYAPO Region	4897	9.2

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information Service, Summary Data Tapes.

The agricultural sector has experienced considerable change over the 15-year period since 1960. Its dominance in 1973 is clear, but its importance has declined from earlier years. Table II-2 presents Census employment figures for 1960 and 1970.[1] In each county except Sweet Grass the absolute amount of employment and the proportion of the total decreased significantly.

There were several forces which acted to bring about a decrease in agricultural employment. First, the long-standing trend toward mechanization has decreased the dependence on labor. Mechanization has also resulted in larger farms. The average farm size in Montana was 2104 acres in 1960 and 2432 in 1970 (Montana Department of Agriculture and Statistical Reporting Service, 1974:8). This causes a decrease in the number of farms and, thus, the amount of agricultural employment.

TABLE II-2

AGRICULTURAL EMPLOYMENT
1960 and 1970

	1960		1970	
	Agricultural Employment	% of Total	Agricultural Employment	% of Total
Big Horn	1195	40.6	885	28.0
Carbon	954	32.4	696	29.1
Stillwater	695	35.4	409	26.7
Sweet Grass	492	40.7	491	39.3
Yellowstone	1928	6.5	1410	4.3

Source: U.S. Bureau of the Census, U.S. Census of Population: 1960, Characteristics of the Population: Montana (Washington, D.C.: U.S. Government Printing Office, 1963).

U.S. Bureau of the Census, U.S. Census of Population: 1970, General Population Characteristics: Montana (Washington, D.C.: U.S. Government Printing Office, 1971).

[1]These data are compiled from the principal industry affiliation of employed persons whereas the Bureau of Economic Analysis (BEA) data given in Table II-1 are compiled on an establishment basis by number of jobs. Because of differences in definitions and data sources, the data in the two tables are not directly comparable.

The trends toward mechanization and large farms is a national, if not world-wide, trend. There are other pressures on agriculture which are less universal. The largest of these is competition with other land uses. The development of recreation and tourism in the counties has led to greatly increased land values. Farming does not generate enough profit to allow purchasing of land at residential prices. As a result, when a farmer retires or sells his farm, the purchaser is not another farmer but is more likely to be a developer or speculator. It follows, then, that there is less land in agricultural production from year to year. Another cause of reduced employment is the recent instability of the market. Prices and costs have fluctuated rapidly, and farming has been discouraged as a profession (McFarland, personal communication, June 2, 1976).

The net result of changes in the agricultural profession is economic hardship for areas that have historically been largely dependent on it. These trends are likely to continue, and agriculture will provide an increasingly smaller portion of income and employment in the MYAPO region.

B. MINING

Mining has historically been an important part of the economic base of Montana, and the MYAPO region is no exception. There was an important coal mining industry in Carbon County, chrome was mined in Stillwater County during World War II, and oil and gas exploration and production have occurred regularly throughout the region. In the last few years, interest in coal development has increased manyfold; there is much renewed interest in chrome and platinum mining in the Stillwater Complex, and there are promising indications of significant new oil finds in deep wells on the east face of the mountains in Stillwater, Sweet Grass, and Carbon Counties. Each of the mining subsectors are discussed below.

C. MANUFACTURING

The manufacturing sector has both basic and nonbasic components. Employment in printing and publishing or in bakeries and dairies are examples of manufacturing activities that serve the local (or regional) population and, therefore, are not considered basic. Billings does have, however, three important manufacturing subsectors that serve national markets and are a significant part of the industrial base of Yellowstone County; these subsectors include sugar refining, meat packing and petroleum refining.

1. Sugar Refining

The Yellowstone River Basin of Montana and the Big Horn Basin of northwest Wyoming have historically been important sugar beet areas. The Great Western refinery opened in Billings in 1906 and has run every year up to the present time. Over the 70-year history of the plant, an average of over 3000 tons of beets has been processed each day of the "campaign" and the campaign has run for an average of slightly less than 100 days per year (Smith, personal communication, June 3, 1976). The 1974-1975 campaign lasted 133 days, and an average of 4223 tons of beets were processed each day.

On a year-round basis, Great Western presently employs about 130 full-time equivalent workers (90 year-round and 60 for eight months) plus an additional 275 persons for the duration of the campaign. Thus, current annual employment on a full-time equivalent basis runs about 230 persons, and its level has not been subject to any significant fluctuations in the past 15 years (Smith, personal communication, June 3, 1976).

2. Meat Packing

There are two large packing houses in Billings--Pierce Packing Company and Midland Empire Packing. Present employment of the two firms combined is about 500 persons but has been as high as 700 persons (Schindele, Pierce, personal communications, June 2, 1976). The economics of the packing industry depends largely on the geographic location of consumers and of supplies of feed grain. Fluctuations in the price of wheat are critical to the economics of the feeding and slaughtering businesses. Wheat could be used as a feed grain in the early 1970s but by 1973 prices were bid up by the demand for wheat as a cereal grain. Presently, prices are once again approaching the point where it can be fed to cattle. If wheat prices are low enough (relative to barley) that it can be used as animal feed, Montana suddenly becomes a large feed grain surplus area, and beef fattening and slaughtering are likely to be profitable. When the price of wheat rises relative to that of barley to the point that it can not be economically used as animal feed, however, then the midwestern corn belt is the only surplus feed grain area in the country, and it is much more efficient to ship the cattle to the grain than the grain to the cattle.

3. Petroleum Refining

There are three oil refineries in Yellowstone County--Continental and Exxon in Billings and Farmers Union in Laurel. Altogether the three firms employed nearly 1000 persons in 1975 with Exxon employing a few more persons than the other two refineries. Table II-3 shows the production history of the three firms over the past 15 years and the source of the oil refined. It is interesting to note that the combined total of Montana and Wyoming crude oil has remained quite stable for each refinery over the 15-year period. However, the importation of Canadian crude has allowed both Exxon and Farmers Union to increase their throughput by about five million barrels per year since the early 1970s, and Canadian crude has been the major portion of Continental's feedstock since the mid-1960s. The capacity of the three refineries and the extent of capacity utilization during 1974 and 1975 is shown in Table II-4. Farmers Union is operating substantially below full capacity, but the nature of the refining activity is such that fluctuations in production have very little effect on employment. Consequently, the contribution of the three refineries to the economic base of the region has been both large and stable over the past 15 years.

Unfortunately, the Canadian government recently announced that exports of petroleum feedstocks would be drastically curtailed until there would be no exports at all to the United States by 1982.

TABLE II-3

CRUDE OIL REFINED IN YELLOWSTONE COUNTY REFINERIES
BY SOURCE OF CRUDE (1000 barrels)

	Continental Oil (Billings)				Exxon (Billings)[1]				Farmers Union (Laurel)			
Year	Montana	Wyoming	Canada	Total	Montana	Wyoming	Canada	Total	Montana	Wyoming	Canada	Total
1961	729	3955		4685	3583	5991		9574	1859	4092		5951
1962	1954	3434	185	5573	2519	9496	12	12028	2754	3740		6495
1963	2418	2241	1046	5705	2200	8739	495	11435	2974	3725		6699
1964	3732	1548	3692	8973	2275	9530	288	12093	2723	4603		7326
1965	2697	3068	4593	10359	2293	9659	37	11989	2635	3665		6300
1966	1773	4148	4674	10595	2318	9557	0	11875	2079	4415		6494
1967	1813	3936	5052	10802	2073	11851	0	13924	1833	5606		7439
1968	1714	1995	10125	13834	1451	12387	222	14060	1264	6533		7797
1969	1637	3443	8482	13562	1240	11964	360	13564	1539	6723		8261
1970	1351	3345	9123	13820	1090	11062	2381	14532	1355	4935	2404	8695
1971	1170	3592	10070	14833	1046	10997	2564	14607	1526	5143	3369	10038
1972	1119	3796	12240	17154	849	10821	3706	15376	1703	4625	4229	10556
1973	1046	3272	12170	16488	1089	10011	5568	16668	1672	4952	5299	11922
1974	1340	4299	11113	16752	744	8753	4870	14367	1599	3897	5697	11192
1975	1703	5809	8960	16472	879	8615	5606	15100	1466	5373	4339	11178

[1] Formerly Humble Oil (1960-1972) and Carter Oil (1953-1959).

Source: Montana Energy Advisory Council, "Historical Petroleum Statistics for Montana," n.d., p. 7.

TABLE II-4

REFINERY CAPACITY COMPARED TO CRUDE OIL THROUGHPUT FOR 1974 AND 1975

Regional	Total Operating Crude Oil throughput Capacity as of 1/1/75 (barrels/day)	Average Crude Oil throughput (barrels/day) 1974	1975	Throughput as Percent of January 1, 1975 Capacity 1974	1975
Continental Oil, Billings	52,500	45,896	45,129	87.4	86.0
Exxon, Billings	45,000	39,362	41,370	87.5	91.9
Farmers Union, Laurel	41,650	30,663	30,625	73.6	73.5

Source: Montana Energy Advisory Council, "Historical Petroleum Statistics for Montana," n.d., p.

D. RECREATION-TOURISM

Recreation and tourism are relatively easy to define qualitatively but very difficult to define operationally. The economic sectors which serve recreation and tourism generally serve the resident population as well. The trade and service sectors of the economy serve the needs of the area's residents and, in that sense, are nonbasic industries. However, whenever the customers of the trade and service sectors are non-residents who are traveling through the area or who have the area as a destination other than for permanent residence, the demand is from outside the area and thus these sectors are basic.

It is impossible to determine exactly the extent to which the trade and service sectors respond to each demand. A fairly accurate approach, whenever personal interview of each individual proprietor is not possible, is to compare an area's employment in the trade and service sectors to such employment in other areas of the same population. If employment is comparatively high, most of the excess may be attributed to recreation and tourism demand. This procedure was applied to the MYAPO region with results as shown in Table II-5.

TABLE II-5

RECREATION AND TOURISM EMPLOYMENT
MYAPO REGION
1973

	Total Trade Employment[a]	Basic Trade Employment[b]	Total Services Employment[a]	Basic Services Employment[b]
Big Horn	522	133	448	---
Carbon	366	197	272	72
Stillwater	214	18	128	3
Sweet Grass	273	140	152	35
Yellowstone	11,444	---	7,566	---
MYAPO Region	12,819	488	8,566	110

[a] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, Summary Data Tapes.

[b] Mountain West Research, Inc.

E. REGIONAL CENTER

The last component of the economic base of the MYAPO region is Billings' role as a trade, services, and transportation-communications center for southern Montana and northwestern Wyoming. Billings is much more highly developed in each of these sectors than could be expected solely on the basis of the basic employment in Yellowstone County. In 1973, for example, the last year for which the county specific BEA data are available, basic employment in Big Horn and Carbon Counties was around 1600 persons while the comparable figure for Yellowstone was 6500, about four times as large. Yet total employment and population in Yellowstone County exceeds the comparable numbers for the two smaller counties by a factor of 10. The explanation is easy--Yellowstone County provides a broad range of services not only to its own residents and to those of the other MYAPO counties but also to persons living within a radius of several hundred miles from Billings.

Probably the most conspicuous employer that depends on Billings' role as a regional center is the health services industry. Its two hospitals employed over 1200 persons in the summer of 1976, and the Billings Clinic employed an additional 220 persons. All three institutions seem to have very similar service areas deriving about 65 percent of their patients from the MYAPO region, 10 percent from Wyoming, and the remainder from other parts of Montana. The three major banks in Billings (Security, Midland National, and First National) employed over 500 persons in the summer of 1976 although their service area seems to be a little less widely spread. Bank management in two of the three institutions estimated that about 80 percent of their business is in the metropolitan area. Mountain Bell employs over 500 persons in Billings, and Montana Dakota Utilities and Montana Power combine for over 250 more. In the manufacturing sector the bakeries are important employers (over 250 persons employed) as is the printing and publishing subsector (over 500 persons). There is also much employment in light fabrication of materials in support of the construction industry throughout the region. Transportation services are important with both the railroad and the trucking subsectors providing about 1000 jobs; and, finally, because Billings is important as a regional commercial and shopping center, there is a high level of employment in the retail and wholesale trade sectors.

TABLE II-6

CALCULATION OF MARKET AREA EMPLOYMENT FOR YELLOWSTONE COUNTY: 1973

Sector	Number of Nonbasic Jobs Per $1000 of Personal Income: Based on Average Relationship for Big Horn Carbon, Stillwater, and Sweet Grass Counties	Estimated nonbasic jobs if Yellowstone County were not a regional center: Based on 1973 PI of $439,941,000	Basic Employment	1973 Total Employment	Estimated market area employment--total employment minus nonbasic minus basic
Manufacturing	.0008	353	2102	3957	1502
Mining	0	0	284	398	114
Contract Construction	.0016	706	449	2121	966
Transportation, Communication, Public Utilities (TCPU)	.0018	794	1019	3417	1604
Trade	.0083	3660	0	11444	7784
Finance, Insurance, Real Estate (FIRE)	.0019	838	0	1747	909
Services	.0070	3087	0	7566	4479
					17358

Source: Income and Employment data from Bureau of Economic Analysis, Regional Economic Information System, Summary Data tapes.

III. THREE ALTERNATIVE FUTURES FOR THE MYAPO REGION

The preceding section has described alternative employment scenarios for the basic industries in each of the five counties. The purpose here is to combine them so that their aggregate implications can be examined for the communities in the region. Alternative Future 1 (AF1) and Alternative Future 3 (AF3) are easy to describe because they simply represent the combination of the lowest scenarios and highest scenarios for each industry. For an industry like agriculture that only has a single scenario, the same numbers are entered for each AF, but for many of the basic industries, there is a substantial difference between the low and the high scenarios. The largest variations occur in oil refining, coal mining, and hard rock mining.

Alternative Future 2 (AF2), on the other hand, is more difficult to characterize. In the case where there is only a single scenario for an industry, there is obviously no interpretation problem. Where there are three industry scenarios, AF2 uses Scenario 2. Where there are two industry scenarios, AF2 uses the scenario felt to be more probable. There are three sectors for which there are only two scenarios--meat packing, oil and gas, and federal government. For meat packing the low scenario is felt to be more probable than Scenario 2. People have always talked of new packing operations in Billings; but, given the basic economic forces acting on the industry and given the vulnerability of the existing two firms to adverse market developments, Billings will be doing well to meet the assumptions of Scenario 1. For oil and gas, Scenario 2 is still fairly conservative and, as explained in the previous section, is thought to be more probable than Scenario 1. Finally, federal government employment under Scenario 2 is thought to be more likely than under Scenario 1. Much of the federal government's activity in the MYAPO region is oriented toward natural resources management that will be affected by western energy development or toward Indian Trust responsibilities which are becoming more complex and more demanding. For these reasons, the 2½ percent annual increase hypothesized in Scenario 2 for the key resource management and Indian-related agencies does not seem at all excessive.

A. COUNTY PROJECTIONS

The county-specific projections demonstrate more variability than the regional projections. In general, the smaller counties are more susceptible to employment changes in any single basic sector than is Yellowstone County or the region as a whole. The result is that differences among the projections for the three alternative futures are large in the smaller counties. Yellowstone County demonstrates considerable ability to absorb industrial changes and experiences smaller variations among the three alternative futures. In each county, however, real personal income per capita nearly doubles, indicating considerable economic growth even in areas experiencing only slight population growth.

Under AF1, population and employment increases in 1979 because of employment associated with the construction of Interstate Highway 90. From then until 1995, the population experiences gradual decline at an average annual rate of .4 percent. During the study period, economic conditions improve considerably as PI per capita rises 84 percent.

AF2 is similar to AF1 until 1986 when mining activity at AMAX begins. The increase in basic employment of 150 causes projected in-migration of 279. During the rest of the study period, a gradual decline of population at an average annual rate of .4 percent continues as under AF1, but the 1995 population is 402 persons larger.

AF3 varies from AF2 only in one item, the magnitude of population change in 1986. AF3 projects a mining employment increase of 450 which results in a net in-migration of 840 in that year. The trend for the remainder of the projection period is gradual decline in population and employment as a result of increased LFPR and productivity.

1. Yellowstone County

The 1975 population of Yellowstone County as estimated by the projection model is 104,613, whereas the Bureau of the Census estimates 97,300. In order to account for these differences, an analysis of other available population estimates and of employment and labor force data for the county was conducted. The analysis uncovered several items which are inconsistent with the Census Bureau estimates.

First, labor force participation rates were calculated using Bureau of the Census population estimates and Employment Security Division employment data. The results are given in Table III- 1. The 1970 rates indicate that Yellowstone County has a slightly higher aggregate participation rate than Montana or the United States. However, using P-26 population figures, aggregate LFPR in 1975 is much higher in Yellowstone County than in Montana. Using the MYAPO model estimate, aggregate LFPR is .453, just slightly higher than the 1975 Montana rate and a more probable figure.

TABLE III-1

LABOR FORCE PARTICIPATION RATES UTILIZING U.S. BUREAU OF THE CENSUS POPULATION ESTIMATES

Year	Yellowstone County	Montana	United States
1970	.411	.400	.404
1971	.418	.400	.406
1972	.437	.415	.414
1973	.467	.424	.422
1974	.481	.438	.429
1975	.490	.444	.434

Source: U.S. Bureau of the Census, "Population Estimates and Projections," Current Population Reports, Series P-26 (Washington, D.C.: U.S. Government Printing Office, 1975).

Montana Employment Security Division, Montana Employment and Labor Force (Helena, selected issues).

Economic Report of the President 1976, p. 196 (Washington, D.C.: U.S. Government Printing Office, February, 1976).

Continuing analysis of these sources points out further inconsistencies. Employment Security reports that between 1970 and 1975 there were 10,500 additional employed persons (residency adjusted) in Yellowstone County. However, the Bureau of the Census estimates that there were only 9,933 more persons in the county in 1975 than in 1970.

Second, population estimates made by the Billings-Yellowstone City-County Planning Board indicate an increase of 9,694 persons from 1970 to 1973 in the transportation study area, only a portion of the county (1975: 2). During the same period, the Census Bureau estimates an increase of only 5833 persons for the entire county.

Third, community population estimates for 1975 indicate an increase of 15,918 residents in urban areas since 1970 (for estimation proccdurc, see following section). This would imply a decrease of 5985 persons in rural areas if Census Bureau estimates for the county are correct. Planners in the county do not believe rural out-migration has occurred to this extent (Cumin, personal communication, June 29, 1976 and Freeman, personal communication, June 25, 1976).

The evidence suggests that there were considerably more than 97,300 residents in Yellowstone County in 1975. There is also some evidence which implies that the increase may not have been as large as the model suggests. It is possible that an increase of 17,247 could have occurred with only small increases in school attendance, but school enrollment over the five-year period has been nearly constant. Still, of the two estimates available, the larger one is more probable.

AF1 projections for Yellowstone County include a drop in population and total employment in 1976, 1979 and 1980 as a result of a drop in basic employment at the oil refineries (Figure III-2 and Tables III-3 to III-5). Every other year is projected to have population, employment, and personal income increases. Projections for the end of the study period, 1995, indicate a total population of 125,297, total employment of 56,971, and personal income of $8337 per capita. Thus, under the low bound projections, population increases at a rate of .9 percent per year, and personal income per capita at an average 3.0 percent annually.

Average annual population growth under AF2 is 1.1 percent, less rapid than the 1.4 percent employment growth annually. Personal income per capita increases even more quickly, that is, at an average annual rate of nearly three percent. The only year in which population and total employment experience a decline is in 1976 as a result of a drop in oil refinery employment. The decrease of 283 employed persons in 1979, when Farmers Union refinery closes, is compensated for by increases in other industries. By 1995, under AF2, population has reached 129,149, employment is projected to be 58,719, and personal income is $8272 per capita. The projections under AF2 indicate a steadily growing economy and population.

The upper bound projections, AF3, have similar personal income per capita increases, average annual employment increase of 1.7 percent, and a 1995 population of 134,535. Growth in population, employment, and economic status of the residents is steady and strong under AF3.

Clearly, projections for Yellowstone County indicate considerable stability and growth for the study period. The only industrial employment declines which bring about net out-migration are those associated with the oil refineries.

The stability of the economy is emphasized by comparison of the three alternative futures. The low and high projections based on possible occurrences in the basic industries vary only slightly. Population in 1995 is seven percent higher under AF3 than AF2, employment is eight percent higher, and total personal income six percent higher. The implication is that the great economic diversity within the county allows fluctuations in individual sectors or companies without large impacts on the total economy.

FIGURE III-2

POPULATION PROJECTIONS FOR YELLOWSTONE COUNTY

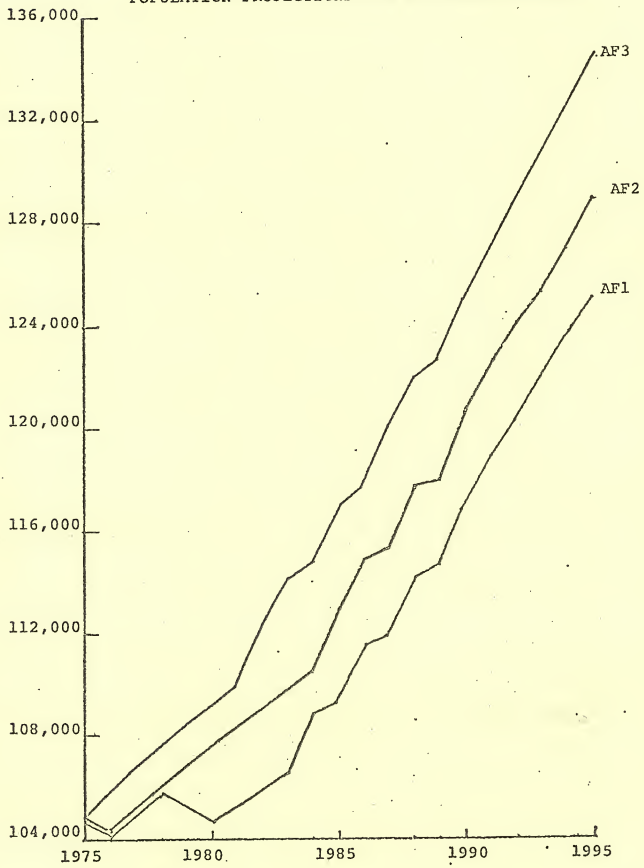


TABLE III- 3

YELLOWSTONE COUNTY POPULATION PROJECTIONS

Year	Alternative Future 1	Alternative Future 2	Alternative Future 3
1975	104,466	104,613	104,715
1976	104,105	104,334	104,481
1977	104,940	105,177	105,328
1978	105,771	106,015	107,579
1979	105,261	106,844	108,421
1980	104,651	107,654	109,260
1981	105,341	108,439	110,073
1982	106,004	109,193	112,377
1983	106,642	109,919	114,223
1984	108,893	110,587	114,954
1985	109,451	113,076	117,321
1986	111,566	114,891	117,949
1987	112,025	115,417	120,386
1988	114,249	117,643	122,124
1989	114,619	118,072	122,605
1990	117,118	120,614	125,244
1991	118,901	122,478	127,232
1992	120,464	124,127	128,949
1993	122,042	125,781	130,899
1994	123,603	127,399	132,680
1995	125,297	129,149	134,535

Source: Mountain West Research, Inc.

TABLE III-4

EMPLOYMENT PROJECTIONS FOR YELLOWSTONE COUNTY

Year	Alternative Future 1	Alternative Future 2	Alternative Future 3
1975	43,968	44,030	44,074
1980	45,490	46,381	47,939
1985	48,408	49,545	51,711
1990	52,164	53,715	56,134
1995	56,971	58,719	61,602

Source: Mountain West Research, Inc.

TABLE III-5

PERSONAL INCOME PROJECTIONS FOR YELLOWSTONE COUNTY

Year	Alternative Future 1		Alternative Future 2		Alternative Future 3	
	Total	PerCapita	Total	PerCapita	Total	PerCapita
1975	$486,605,164	$4658	$487,182,008	$4657	$487,547,395	$4656
1980	576,321,437	5507	585,300,500	5438	601,429,531	5504
1985	696,928,484	6367	709,872,297	6277	734,008,789	6251
1990	850,169,703	7255	869,237,930	7199	899,162,266	7166
1995	1,046,487,562	8337	1,070,192,000	8272	1,109,566,594	8228

Source: Mountain West Research, Inc.

2. Community Population Projections

In each county and under all three alternative futures, the rural residual population decreases considerably because of the allocation scheme which out-migrates one percent of the previous year's rural population. In each of the counties except Yellowstone, there is an additional influence causing rural population decline; namely, that total natural population change is negative, a fact which the rural areas share in proportion to the population. Big Horn County is somewhat different in that total natural population change is positive but the rural population is considered to be entirely Anglo and Anglo population has more deaths and educational migration than births each year. In Yellowstone County, there is a natural increase in population each year, part of which is allocated to the rural area. The importance of this can be seen in the fact that Yellowstone County rural population declines by less than nine percent during the study period whereas the remainder of the counties have at least 22 percent decline over the same period.

The projections for some of the communities in each county except Yellowstone experience population changes based entirely on natural growth or decline. All communities which were not part of the basic employment residential allocation are assumed not to have in- or out-migrants and thus reflect only deaths, births, and educational migrants. Those communities to which migration is allocated have much more fluctuation in population, both upward and downward.

In summary, projections for MYAPO region communities demonstrate the same relative vulnerability as their respective counties. Communities in outlying counties experience either gradual declines or demonstrate extreme vulnerability to employment level changes, particularly in response to mining activity. Carbon County is projected to have more steady growth because no large, immediate changes in basic employment are foreseen. Yellowstone County communities grow at a steady pace, again mirroring the diversity of the economic base of the county.

TABLE III-6

COMMUNITY POPULATION PROJECTIONS
YELLOWSTONE COUNTY

	Ballantine	Billings	Billings Heights	Huntley	Laurel	Lockwood	Shepherd	Worden	Rural Residual
Estimated 1975[a]	375	72,700	7,700	400	6000	3000	200	625	13,613
AF1									
1980	367	73,591	7,338	375	6004	2887	166	595	13,328
1985	398	77,232	8,025	418	6327	3147	202	661	13,069
1990	454	82,485	9,422	506	6885	3654	290	765	12,683
1995	517	87,970	11,028	607	7498	4231	388	891	12,193
AF2									
1980	388	75,329	7,909	411	6205	3087	202	638	13,485
1985	421	79,362	8,666	458	6580	3373	242	694	13,280
1990	473	84,571	9,998	541	7124	3857	321	793	12,936
1995	539	90,278	11,660	645	7759	4449	422	923	12,474
AF3									
1980	398	76,254	8,204	429	6309	3189	221	660	13,596
1985	451	81,903	9,474	507	6875	3650	292	752	13,417
1990	508	87,343	10,873	594	7455	4151	373	867	13,078
1995	578	93,535	12,652	705	8142	4785	480	1007	12,651

[a] As estimated in Table III-77. Rural residual equals AF2 value for county for 1975 minus community estimates.

Source: Mountain West Research, Inc.

IV. DEMONSTRATION OF THE USE OF THE MODEL IN ECONOMIC IMPACT ANALYSIS

A. AN EXAMPLE INVOLVING A REDUCTION OF MANUFACTURING EMPLOYMENT BY 100 PERSONS IN YELLOWSTONE COUNTY

Suppose that a waste water control plan were proposed that necessitated a surcharge on an industrial discharger into Billings municipal sewer system of an order of magnitude such that the firm was forced out of business. Assume that the firm was in the manufacturing sector and that it employed 100 persons. We know that this will have a direct effect on employment and income in Yellowstone County, but there will be indirect effects as well. The decline in basic income will cause personal income to be lower, and the lower level of PI will mean lower levels of nonbasic employment which will cause PI to be even lower and the process continues. Further, as total employment falls, the unemployment rate will rise with the consequence that there may be out-migration (or smaller in-migration) causing population to be lower.

The model can be used to derive quantitative estimates of the implications of the loss of the manufacturing jobs as is shown in Table IV-1. The first step is to project population, employment, and income under the assumption that the manufacturing plant does not close. This was done under the assumptions of AF1, and the results are in the first five columns of Table IV-1. Identical assumptions are then fed into the computer again except that this time manufacturing employment is reduced by 100 jobs in every year from 1976 on. Thus, there are no changes from 1973 to 1975, but from 1976 on, the new population, employment, and income numbers are all lower than before and the difference can be attributed to the closing of the manufacturing firm.

The table shows that the county population is smaller on the average by about 450 persons, that a total of about 220 jobs are lost (100 in manufacturing and 120 nonbasic), and that personal income (in constant 1973 dollars) is lower by about $2 million at the beginning of the period. But, by the end of the period, the loss would approach $3 million because productivity changes would have caused real wages to rise, and the loss of 200 jobs in 1995 reduces PI by more than does a loss of 200 jobs in 1975.

The far right-hand side of Table IV-1 expresses some of these results in the form referred to by economists as multipliers. The first column of multipliers shows, for example, that for the loss of each basic job, population goes down by about 4.5. The employment multiplier is about 2.2; while, if we divide the change in personal income by the change in basic income, we get income multipliers of about 1.65. The reason that the income multiplier is lower than the employment multiplier is because wages in manufacturing are substantially higher than wages in the nonbasic industries. Thus, even though the loss of 100 basic jobs in manufacturing causes the loss of 120 nonbasic jobs, the proportional decrease in nonbasic income is much smaller because of the lower wages in the nonbasic sectors.

TABLE IV-1

EVALUATION OF THE EFFECT OF THE LOSS OF 100 MANUFACTURING JOBS IN YELLOWSTONE COUNTY STARTING IN 1976[a]

	AFl With Manufacturing Jobs					AFl With 100 Less Jobs in Manufacturing Starting in 1976							
	Popula-tion	Basic Employ-ment	Basic Income (000)	Employ-ment	Personal Income (000)	Popula-tion	Basic Employ-ment	Basic Income (000)	Employ-ment	Personal Income (000)	Change in Popula-	Change in Employ-	Chang PI (000
1973	98,344	6547	$ 79,237	41,149	$ 438,451	98,344	6547	$ 79,237	41,149	$ 438,451	-----	-----	$ -----
1974	100,898	6409	80,392	42,541	462,312	100,898	6409	80,392	42,541	462,312	-----	-----	-----
1975	104,466	6348	81,446	43,968	486,605	104,466	6348	81,446	43,968	486,605	-----	-----	-----
1976	104,102	6270	82,367	44,406	504,048	103,729	6170	81,127	44,229	502,296	-373	-177	-175
1977	104,937	6603	89,148	45,233	527,355	104,551	6503	87,874	45,022	525,277	-386	-211	-207
1978	105,768	6671	92,289	45,671	546,689	105,368	6571	90,981	45,458	544,544	-400	-213	-214
1979	105,258	6442	91,597	45,590	561,299	104,787	6342	90,253	45,375	559,095	-471	-215	-220
1980	104,648	6246	91,306	45,490	576,321	104,138	6146	89,927	45,270	574,031	-510	-220	-229
1985	109,452	6565	109,951	48,408	696,928	108,919	6465	108,375	48,185	694,314	-533	-223	-261
1990	117,190	6967	135,746	52,164	850,169	116,699	6867	133,945	51,942	847,256	-491	-222	-291
1995	125,528	7465	171,967	56,971	1,046,487	125,085	7365	109,910	56,753	1,043,252	-443	-218	-323

[a]All income data expressed in constant 1973 dollars.

Source: Mountain West Research, Inc.

TABLE IV-1 (continued)

	Change in Population / Change in Basic Employment	Change in Employment / Change in Basic Employment	Change in Personal Income / Change in Basic Income	Change in Basic Income / Change in Basic Employme (in thousands per employ
1973	----	----	----	----
1974	----	----	----	----
1975	----	----	----	----
1976	3.73	1.77	1.41	12.40
1977	3.86	2.11	1.63	12.74
1978	4.00	2.13	1.64	13.08
1979	4.71	2.15	1.64	13.44
1980	5.10	2.20	1.66	13.79
1985	5.33	2.23	1.66	15.76
1990	4.91	2.22	1.62	18.01
1995	4.43	2.18	1.57	20.57

Source: Mountain West Research, Inc.